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The Demographics of Mortality in California

By Hans P. Johnson and Joseph M. Hayes

Summary

Differences in health outcomes between racial and ethnic groups are of concern to government agencies, health providers, and policymakers. To the extent that they reflect differential access to and quality of health care, differences in health outcomes are particularly troubling. Congress has passed laws, and health agencies have established programs, with the intention of eliminating racial and ethnic disparities in health. In California, the Office of Multicultural Health was established in 1993 to reduce gaps in health status between California's diverse population groups.

The most basic measures of a population's health—mortality rates and life expectancies—have not been estimated for many of California's racial and ethnic groups. One primary reason for this absence of vital information has been the lack of reliable estimates of the base populations needed to make these measurements. Recently released data from the 2000 census provide detailed population counts for many of California's racial and ethnic groups. In this edition of *California Counts*, we combine California administrative records on deaths with census population counts to develop mortality rates for 19 groups in California. We calculate infant mortality rates and life expectancies—a summary measure of age-specific death rates—to describe these death rates, and we examine them as they vary by age, gender, and nativity (U.S.-born versus foreign-born) for racial and ethnic groups. Caution must be exercised in using and interpreting our results. Data limitations could lead to inaccuracies in our measurements.

We find substantial differences in life expectancies between men and women, between U.S. natives and immigrants, and across racial and ethnic groups in California. Some of the greatest variations are found between racial and ethnic groups. Life expectancies of Asian

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U.S.-born Chinese females live more than 20 years longer, on average, than U.S.-born black males.

Indians (84.3 years) are more than 12 years longer than those of blacks (72.1 years). Adding gender and nativity can further increase these differences. In the most extreme example, U.S.-born Chinese females live more than 20 years longer, on average, than U.S.-born black males (89.2 versus 68.7 years). In general, life expectancies for immigrants are higher than for U.S. natives (81.5 versus 77.4 years)—a finding that might appear counterintuitive because of most immigrants' lower socioeconomic status, less access to health care, and higher mortality rates in their countries of origin. Differences by nativity vary tremendously across racial and ethnic groups, with foreign-born blacks and Mexican males having the largest advantage over their native-born co-ethnics. Indeed, U.S.-born Mexican males have lower life expectancies than white males, whereas foreign-born Mexican males have longer life expectancies than white males. Among some Asian groups, U.S. natives outlive immigrants. For every ethnic group, women have lower mortality rates and thus live longer than men. Overall, female life expectancies are 4.8 years longer than those of males (80.8 years versus 76.0 years).

Infant mortality rates are an important component of life expectancies and a basic measure of health in their own right. We calculate infant mortality rates and compare them across racial and ethnic groups in an attempt to gain a clearer picture of comparative health outcomes and to help interpret the results of the life expectancy analysis. For the most part, racial and ethnic differences in infant mortality rates are consistent with the patterns we estimate for overall life expectancies. Infant mortality rates are much higher for blacks (12.7 infant deaths per thousand births) than for whites (4.9 per thousand) or Latinos (5.1 per thousand); Asian rates are the lowest of the major groups, at 3.6 per thousand.

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Introduction

Mortality rates and life expectancies have not been determined for many of California's racial and ethnic groups. This lack of data extends to nativity, with little if any documentation on mortality rate differences between immigrants and U.S. natives. The absence of such information can be attributed to three primary factors. First, the base populations necessary to calculate mortality rates—populations disaggregated by age, gender, and nativity—are generally not available for most racial and ethnic groups between censuses. Even for some of the state's largest racial and ethnic groups, census data provide the only reliable population counts—and even then, there are debates about accuracy. Second, for some of the smaller, more recently arrived immigrant groups, the number of deaths is very low, rendering mortality rate estimates highly uncertain. Third, inconsistencies in racial and ethnic identification between the census and administrative vital records are potentially very large.

Recently released 2000 census data and California's rapidly growing populations of specific Asian and Latino ethnic subgroups make this an opportune time to estimate mortality rates and life expectancies in California. In this report, we develop age-specific mortality rates and life expectancies for 19 groups. We define these groups by race/ethnicity (see Table 1), gender, and nativity. However, because population sizes and the number of deaths for some groups are so small, disaggregations by nativity and even gender are not always possible. Our death rate and life expectancy calculations use the California Department of Health Services (DHS) Death Public Use File and the 2000 census Public Use Microdata Sample (PUMS) for establishing base populations.[1] To the extent possible, we consider the effects of potential biases in our estimates of mortality rates and life expectancies. We note that the 2000 census was estimated to be the most accurate census ever undertaken in the United States, with an overall net undercount rate of less than 1 percent (Edmonston, 2002),[2] and deaths are thought to be universally recorded. However, age misreporting and inconsistencies in the reporting of racial and ethnic identities between the census and death records are of uncertain magnitude and could affect our results.

Despite the lack of data on mortality rates for many groups, differences in health outcomes between ethnic groups are of great interest and concern. Government agencies, health providers, and policymakers are concerned about racial and ethnic disparities in health outcomes and the lack of data on health outcomes for numerous smaller minority groups.

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According to the Centers for Disease Control and Prevention (2003), "because racial and ethnic minority groups are expected to comprise an increasingly larger proportion of the U.S. population in coming years, the number of people affected by disparities in health care will only increase without a concerted effort to eliminate these disparities." The Disadvantaged Minority Health Improvement Act of 1990 (Public Law 101-527) authorized the National Center for Health Statistics to establish a grants program to improve minority health statistics, and the U.S. Department of Health and Human Services has established national standards for "culturally and linguistically appropriate services" in health care (U.S. Department of Health and Human Services, 2001). In California, the Office of Multicultural Health was established in 1993 to reduce gaps in health status between California's diverse population groups. The

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Table 1. Racial and Ethnic Categories

Category Used in This Report	DHS/Census Racial Designation	DHS/Census Hispanic Origin
White	White	Not Spanish/Hispanic
Black	Black	Not Spanish/Hispanic
American Indian	American Indian, Eskimo, Aleut	Not Spanish/Hispanic
All Asian groups	Asian-Unspecified, Asian-Specified, Asian-Chinese, Asian-Japanese, Asian-Korean, Asian-Vietnamese, Asian-Cambodian, Asian-Thai, Asian-Laotian, Asian-Hmong, Asian-Indian, Filipino	Not Spanish/Hispanic
Pacific Islander	Hawaiian, Guamanian, Samoan, Other Pacific Islander	Not Spanish/Hispanic
All Latino groups	Any race	Mexican/Mexican-American/Chicano, Puerto Rican, Cuban, Central/South American, Other Spanish/Hispanic
Latino subgroups		
Mexican	Any race	Mexican/Mexican-American/Chicano
Puerto Rican	Any race	Puerto Rican
Cuban	Any race	Cuban
Central/South American	Any race	Central/South American
Asian subgroups		
Asian Indian	Asian-Indian	Any Hispanic origin
Cambodian	Cambodian	Any Hispanic origin
Chinese	Chinese	Any Hispanic origin
Filipino	Filipino	Any Hispanic origin
Hmong	Hmong	Any Hispanic origin
Japanese	Japanese	Any Hispanic origin
Korean	Korean	Any Hispanic origin
Laotian	Laotian	Any Hispanic origin
Vietnamese	Vietnamese	Any Hispanic origin

Notes: The 2000 census and California DHS death certificate data for 2000 and 2001 allow multiple entries for the race/ethnicity of each individual. In addition, a value for Hispanic origin is recorded. In the event that a non-Hispanic respondent listed two or more entries that did not belong to a single major racial group (e.g., black and white), the respondent was listed as "Two or more races." This category had insufficient numbers to calculate reliable estimates, so its results are not reported here.

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Measuring Death Rates and Life Expectancies

We develop abridged life tables for 19 ethnic groups in California.[a] For each ethnic group, nine life tables were developed (two by gender, two by nativity, four by both gender and nativity, and one total). Life expectancies for all groups are available at PPIC's online Data Depot (http://www.ppic.org/main/datadepot.asp). We follow Chiang (1984) in constructing the life tables. The key ingredient in the life table is the age-specific death rate (ASDR). The ASDR is the number of deaths among people in an age interval divided by the number of people in that age interval. It is often reported in terms of deaths per thousand people. All other life table values, including life expectancies, follow directly from ASDRs. We used California vital statistics data files on deaths in 2000 for our numerators (California Department of Health Services, 2000) and population counts from the 2000 census for our denominators. For groups with relatively few deaths, we averaged deaths over a three-year period (1999, 2000, and 2001) to develop ASDRs. Deaths of unknown age or unknown nativity were distributed according to the distribution of deaths of known ages and nativities. The number of deaths of unknown age or unknown nativity is very small. Overall, 99.95 percent of all deaths are of known age, and 99.66 percent are of known nativity. Weighted population counts by age, gender, race/ethnicity, and nativity from the five percent PUMS files of the 2000 census were controlled to population totals by age, gender, and race/ethnicity from Summary File 2 data of the 2000 census. The Summary File 2 data are drawn from all census respondents but do not include nativity. PUMS data are drawn from a one-in-twenty sample of census respondents (Ruggles et al., 2003) but have the advantage of including data on place of birth.

We develop standard errors and confidence intervals for the life expectancies. All of the life expectancies shown in Table 2 and discussed in this report have 90 percent confidence intervals of less than one year around the point estimate (PPIC's online Data Depot includes tables of standard errors and confidence intervals for the life expectancies). These standard errors and life expectancies are primarily determined by the number of deaths. Life expectancies for groups with large numbers of deaths have low standard errors and narrow confidence intervals. Standard errors and confidence intervals do not reflect some potential sources of error in the life expectancies, including measurement errors in base populations, age misreporting, and inconsistency in the reporting of racial and ethnic identities.

We do not report results for population groups with implausibly high life expectancies: Other Hispanics and people of two or more races. Either far more people were identified in those categories in the census than appears warranted given the number of deaths for those groups or too few deaths were attributed to those groups on the death certificates.

For mortality rates in the first year of life, we created three measures: infant mortality rates based on death certificate data and census population counts (as with the other ASDRs), infant mortality rates based solely on vital statistics on births and deaths (from DHS public use birth and death files for 2000 and 2001), and infant mortality rates based on the Birth Cohort File of DHS that links infant births with deaths. The first measure is based on infant deaths per thousand infants, and the other two measures are based on infant deaths per thousand births.

[a] This includes life tables for all Asians combined and for all Latinos combined.

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Table 2. Life Expectancies by Racial/Ethnic Group, California, 2000

	Male		Female						
	U.S.-Born	Foreign-Born	U.S.-Born	Foreign-Born	All Male	All Female	All U.S.-Born	All Foreign-Born	Total
All Californians	75.0	79.3	79.9	83.4	76.0	80.8	77.4	81.5	78.4
Major ethnic groups									
White	75.3	77.5	79.9	81.7	75.5	80.1	77.7	79.7	77.8
Black	68.7	74.4	75.1	79.3	69.0	75.3	71.9	77.2	72.1
All Asian groups	82.5	80.6	88.2	85.2	80.5	85.2	85.4	83.1	83.0
All Latino groups	75.6	79.7	82.6	84.3	77.7	83.2	79.2	82.1	80.5
Latino subgroups									
Mexican	74.3	78.9	81.7	83.2	76.6	82.0	78.0	81.1	79.3
Puerto Rican	76.7		82.3		77.1	82.7	79.5		79.9
Cuban		77.2		83.0	77.5	83.9		80.2	80.7
Central/South American		76.7		81.6	75.5	80.6			78.4
Asian subgroups									
Asian Indian		80.3		86.9	81.5	88.1		83.1	84.3
Cambodian[a]		75.5		81.6				78.2	77.3
Chinese	83.5	81.8	89.2	85.4	81.8	85.5	86.6	83.7	83.7
Filipino		80.1		85.6	79.7	85.3		82.9	82.5
Hmong[b]		78.3		82.0				80.2	79.3
Japanese	81.2		85.3	85.4	80.9	84.6	83.2	83.9	82.9
Korean		80.9		84.9	80.8	85.2		83.0	83.2
Laotian[a]		73.0		80.4				76.5	75.3
Vietnamese		82.2		85.6	82.0	85.7		83.7	83.8
Other groups									
American Indian	76.3		79.4		76.6	79.6	78.0		78.2
Pacific Islander					70.5	77.8			74.0

Source: Authors' calculations based on DHS public use files and 2000 census data.
Note: Life expectancies are not reported in cases where the 90 percent confidence interval exceeds one year around the estimated life expectancy.
[a]Calculations are three-year averages using data from 1999–2001 death certificates.
[b]Calculations are two-year averages using data from 2000–2001 death certificates.

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office seeks to achieve this goal through "improved planning and coordination of activities and programs related to racial and ethnic populations in California" (Office of Multicultural Health, 2004).

Data Limitations

One key concern in developing mortality rates and life expectancies for small populations is the relatively small number of deaths. For smaller ethnic groups, disaggregation of deaths by age, gender, and nativity can lead to certain categories having zero deaths (e.g., U.S.-born Hmong males ages 55–59). Annual variation can be extreme in such cases, and mortality rate estimates are not precise. To limit such problems, we restrict our single-year analyses to groups with at least 200 deaths. For ethnic subpopulations with fewer than 200 deaths for the year 2000, we augment the death certificate data with the years 1999 and 2001 to calculate a three-year average. Following Chiang (1984), we develop standard errors and confidence intervals for our estimates. For the life expectancies presented in this report, none of the 90 percent confidence intervals are greater than one year around the estimated life expectancy.[3]

Another concern is age misreporting. To the extent that ages are overstated on population counts and on death records, life expectancies will be overstated as well. Previous research has suggested that blacks and Latinos are more likely to have misreported and overstated ages (Elo et al., 2004; Elo and Preston, 1997).

Perhaps the most serious problem in estimating mortality rates is inconsistency in racial and ethnic identification between death records and census populations. DHS has had the foresight to establish and report deaths using racial and ethnic categories that are nearly identical to those in the 2000 census. Unfortunately, it is not possible to know for certain whether the reporting of racial and ethnic identities on death records is consistent with how deceased persons were identified in the census. Other researchers have found evidence of age misreporting and inconsistencies in racial and ethnic classification (e.g., Elo and Preston, 1997). DHS assumes that race is poorly reported on death certificates.[4] Funeral directors generally fill out the demographic portion of the certificate based on information obtained from the informant (who may or may not be next of kin). Funeral home staff do not like to bother informants more than necessary, so they often just guess at race and ethnic origin. Even the next of kin might not report the race of a decedent the same way he or she would have self-reported to the census. It's also clear by analysis that being of more than one race is badly underreported on death certificates (Heck et al., n.d.).

Perhaps the most serious problem in estimating mortality rates is inconsistency in racial and ethnic identification between death records and census populations.

For infant death rates, we assess this potential bias by estimating and comparing three measures of infant mortality rates. Two of the measures are based solely on vital statistics records on births and deaths, and the third is calculated using the same method we use for other ages (using deaths from DHS vital records in the numerator and census populations in the denominator). The extent to which these measures of infant mortality rates differ for the same racial and ethnic group serves as a guide to identifying potential mismatches in racial and ethnic identification between death records and census populations. For example, if Chinese infant mortality

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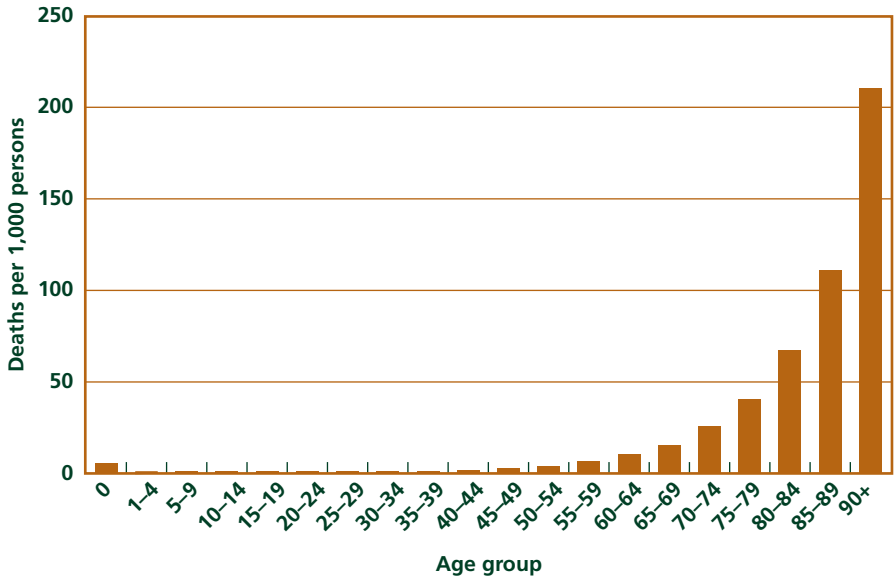
rates calculated using the vital statistics measures appear higher than those for Chinese based on vital records and census population counts, we would suspect that our finding of low death rates for Chinese at other ages is biased. Either census counts of Chinese are too high, or Chinese deaths are misidentified. Of course, these observations apply only strictly to infant mortality rates; it is possible that rates at other ages are not similarly biased.

Figure 1. Age-Specific Mortality Rates, California, 2000



Source: Authors' calculations based on DHS public use files and 2000 census data.

Death Rates by Age Group

The vast majority of deaths and the highest mortality rates occur at older ages (Figure 1). This pattern is consistent for both genders, for all racial and ethnic groups, and for both the U.S.-born and the foreign-born (not shown). After the first year of life, the probability of dying increases with age throughout the life span. In California, deaths before age 50 are very unusual—95 percent of all Californians survive to age 50, and almost 90 percent survive to age 60. These extremely low mortality rates at younger ages are common throughout the developed world and in many less developed countries that have experienced the "epidemiological transition." This transition from high death rates to low death rates occurs with increasing standards of living (including improved nutrition), public health improvements (such as improved sanitation), better access to health care, and more efficacious medical treatments that lead to declines in infectious and parasitic diseases. The decline in such diseases leads not only to lower mortality and longer life expectancies but also to a shift in causes of death toward chronic diseases (such as heart disease and cancer).

Because the age pattern of mortality (as shown in Figure 1) does not change from group to group in California, groups with high life expectancies tend to have lower mortality rates at every age than groups with relatively low life expectancies. We do find two notable exceptions. First, as with past estimates of age-specific mortality rates in the United States, we see a crossover effect for blacks at very old ages. Specifically, for every age group up to age 90, we observe higher mortality rates for blacks than for non-Hispanic whites. However, for the oldest age group—those ages 90 and over—we observe lower mortality rates for blacks than for whites (Figure 2). There is debate about whether this crossover effect is real or simply a reflection of overstatement of age among older blacks

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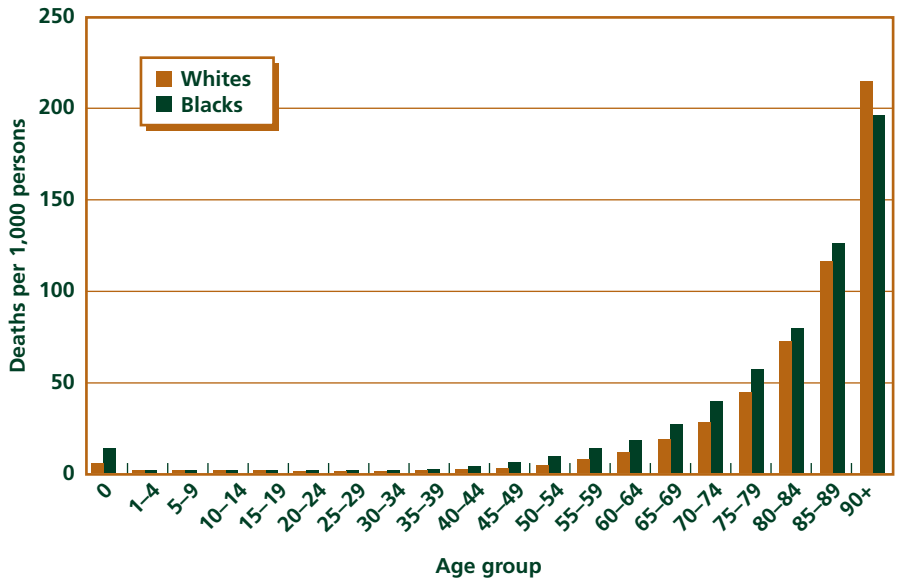
Figure 2. Age-Specific Mortality Rates for U.S.-Born Whites and Blacks, California, 2000



Source: Authors' calculations based on DHS public use files and 2000 census data.

(Sorlie et al., 1995; Elo and Preston, 1997). Evaluations of death and population records suggest that age misreporting is the most likely explanation (Elo and Preston, 1997). Second, we find that Latino male mortality is higher than that of whites at very young ages (5–9) and at older teen ages (15–19) but lower overall and at most other ages. Hayes-Bautista et al. (2002) have called the result for teens the "Latino adolescent male mortality peak."[5] We find mortality rates for Latino males ages 15–19 to be 1.4 times higher than those of white males ages 15–19. This can be attributed to much higher death rates from homicide among Latino males. Among Latino males ages 5–9, a higher rate of deaths from accidents accounts for most of the mortality difference.

Life Expectancies

Life expectancies are a summary measure of age-specific death rates. In this report, we focus on life expectancies at birth, although we also discuss age-specific death rates where noteworthy. Life expectancies are the number of years a child born in a certain year, 2000 in our case, could be expected to live if current age-specific death rates prevail throughout his or her lifetime.[6] We first discuss our results for various ethnic groups, then by nativity (U.S.-born and foreign-born), and finally by gender. Table 2 provides detailed breakdowns of life expectancies for many of California's racial and ethnic groups.

Life Expectancies by Ethnicity

Life expectancies vary substantially across racial and ethnic groups in California. Among the major ethnic groups in the state, life expectancies are relatively high for Asians and Latinos, near the state average for whites, and quite low for blacks

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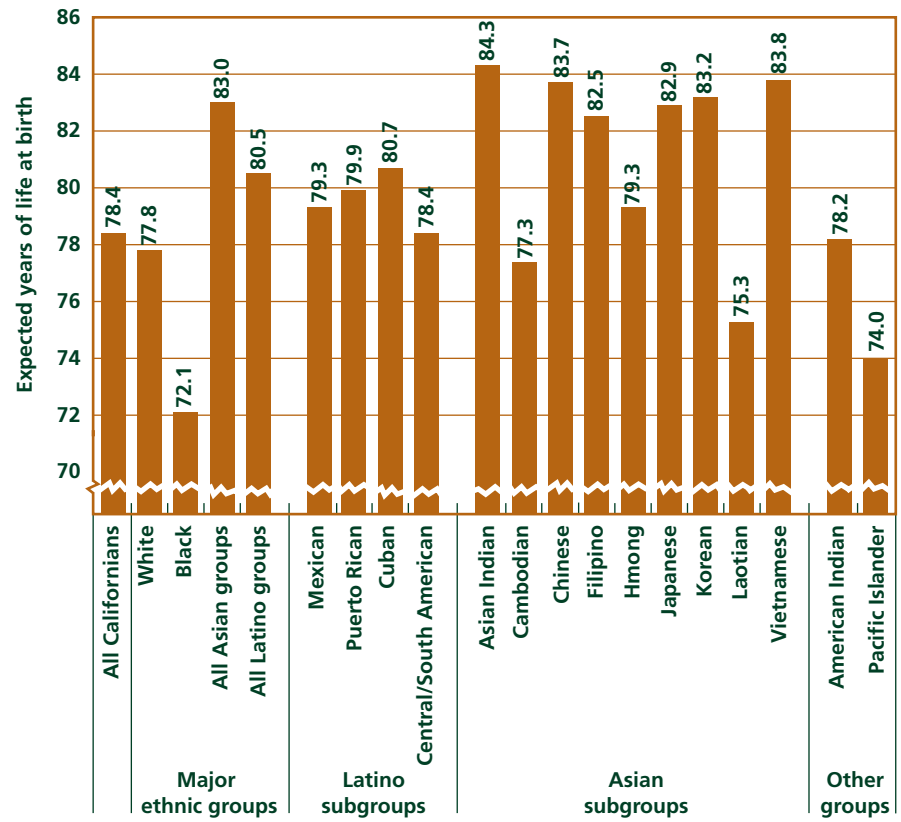
Figure 3. Life Expectancies by Ethnic Group, California, 2000



Source: See Table 2.

(Figure 3). All the Latino subgroups have life expectancies that are at least as high as the state average. Among the Latino subgroups, Cubans have the longest life expectancy, exceeding the state average by over two years. Life expectancies for Mexicans exceed the state average by about a year. Almost all of the Asian subgroups have life expectancies that exceed the state average. The longest life expectancies are recorded by Asian Indians, with life expectancies that exceed the state average by almost six years (84.3 versus 78.4). Exceptionally long life expectancies are also observed for Vietnamese, Chinese, Koreans, Japanese, and Filipinos, all of whom have life expectancies at least four years higher than the state average. The lowest Asian life expectancies are observed for Laotians and Cambodians, whose life expectancies are below the state average. Finally, American Indians have life expectancies just below those of the state average, and Pacific Islanders have particularly low life expectancies—more than four years lower than the state average and higher only than life expectancies for blacks. Life expectancies for blacks are more than 12 years lower than for Asian Indians and more than six years lower than the state average (72.1 versus 78.4).

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These differences in life expectancies are not well studied for many of the subgroups.[7] Among the larger ethnic categorizations, longer life expectancies for Asians and Latinos than for whites have been observed for some time. Hummer et al. (1999) note the importance of "favorable health behavior patterns" in explaining low mortality rates among Asians. In California, Asians have the lowest rates of smoking and obesity (National Center for Health Statistics, 2001). Because Latinos generally have lower socioeconomic status and less access to health care, their low mortality rates and long life expectancies have been termed the "Hispanic epidemiological paradox." Numerous factors have been suggested to explain this paradox, which we discuss in the subsection on nativity.

Lower life expectancies for blacks have also been noted for some time. The most common explanations for higher mortality rates among blacks include behavioral and socioeconomic factors as well as discrimination (Society of Actuaries, 2004). Blacks in California are less likely than whites to have health insurance (Reyes, 2001). And some studies suggest that blacks tend to receive less efficacious medical treatment than whites, even controlling for health insurance (Venkat et al., 2003; Kressin and Petersen, 2001). Obesity and rates of smoking are also higher among blacks than among whites in California (National Center for Health Statistics, 2001).

Life Expectancies by Nativity

Immigrants live longer than U.S. natives. Life expectancy for immigrants in California in 2000 was 81.5 years, compared to 77.4 years for U.S. natives. The difference (4.1 years) is almost as large as that observed between male and female life expectancies. Given immigrants' generally lower socioeconomic status, less access to health care in the United States, and typically worse health conditions in their countries of origin, this finding may appear surprising. Other factors, however, can be identified to explain the longer life expectancy among immigrants. First, there is a selection effect. Migrating internationally is a serious and often difficult proposition. People who have health problems or who are chronically ill are not likely to make such moves. Thus, people who move internationally tend to be healthier than those left behind. Second, immigrants may have fewer behavioral risks, such as cigarette smoking, than U.S. natives. Third, immigrants may have better diets than U.S. natives. Finally, some researchers have suggested cultural factors as well. These could include strong and stable marriages and a family life that includes large networks of people who provide health information informally (Williams and Collins, 1995).

The low life expectancies of all blacks in California are driven primarily by the poor health outcomes of U.S.-born blacks.

There is substantial variation across ethnic groups in health outcomes between immigrants and U.S. natives. As shown in Figure 4, white, black, and Latino immigrants all live longer than their native-born ethnic counterparts. The difference is especially large among blacks, with foreign-born blacks living over five years longer on average than U.S.-born blacks. Foreign-born blacks have life expectancies that are about the same as those of all U.S.-born Californians (77.2 and 77.4 years, respectively). Thus, the low life expectancies of all blacks in California are driven primarily by the poor health outcomes of U.S.-born blacks. (The vast majority of blacks in California are U.S.-born.) Latino immigrants, including the Mexican subgroup, have life expectancies that are about three years longer than their U.S.-born counterparts, whereas white immigrants live two years longer, on average, than U.S.-born whites. Among Latinos and particularly Mexicans, differences are especially large among men: Foreign-born males

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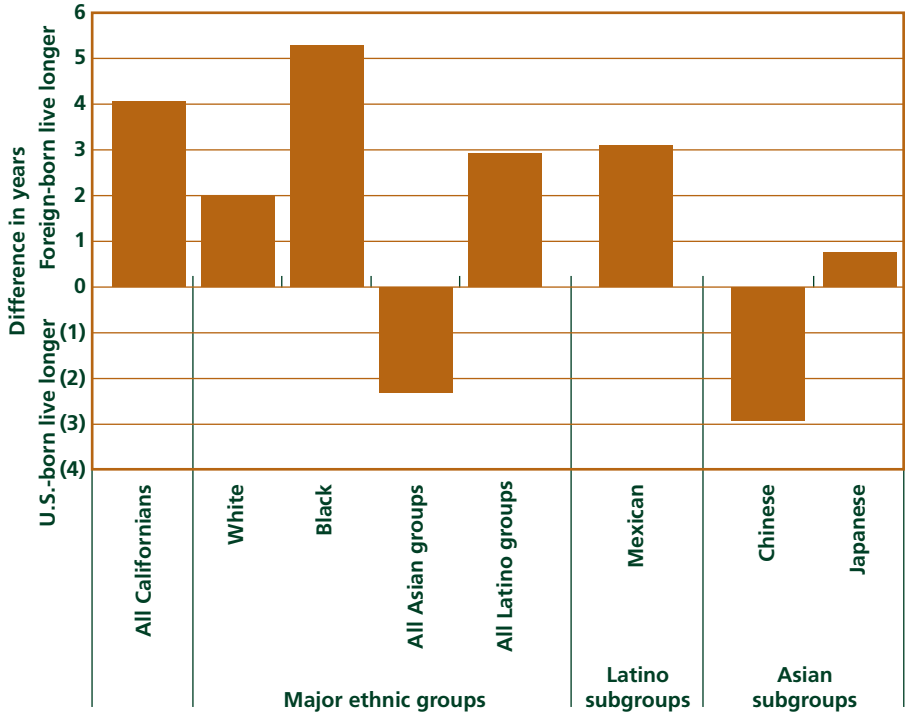
Immigrants live longer than U.S. natives.

Figure 4. Additional Years of Life Expectancy of Immigrants Compared to Natives, California, 2000



Source: Authors' calculations based on DHS public use files and 2000 census data.

have life expectancies that are 4.1 and 4.6 years longer (respectively) than their U.S.-born counterparts (Table 2). Indeed, U.S.-born Mexican males have life expectancies that are lower than those of non-Hispanic white males in the state, a finding that is consistent with their generally lower socioeconomic status and lower access to health insurance. Thus, among U.S.-born men, there is no Hispanic epidemiological paradox.

Not all immigrant groups have longer life expectancies than their U.S.-born ethnic counterparts. In direct contrast to the experience of other ethnic groups, Asian immigrants tend to have lower life expectancies than their U.S.-born counterparts. Life expectancies are high for Asian immigrants but are higher still for U.S.-born Asians. Overall, life expectancies of U.S.-born Asians are 2.3 years longer than for their immigrant counterparts. Among Chinese, the difference is almost three years. Japanese life expectancies are an exception to the Asian pattern, with slightly lower expectancies for the U.S.-born. Because most other Asian subgroups are primarily foreign-born, especially among seniors, there are insufficient numbers of deaths among the U.S.-born to develop estimates of life expectancies.

Life Expectancies by Gender

Women live longer than men. Overall in California, women live almost five years longer than men (80.8 versus 76.0 years). At all ages—even in infancy—males have higher mortality rates than

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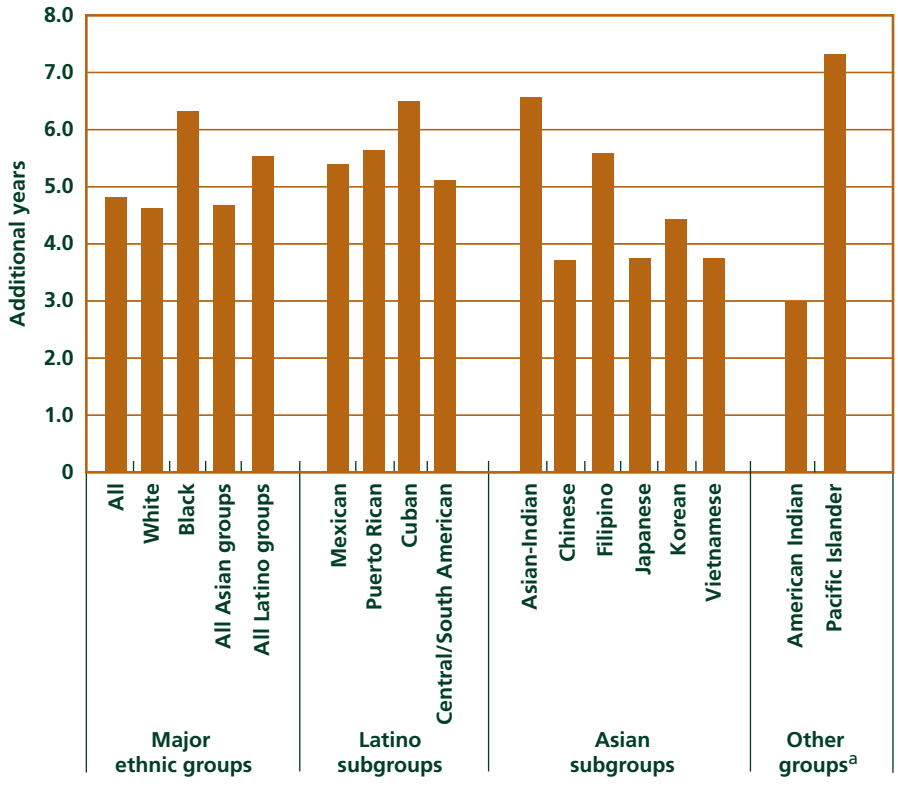
females. Absolute differences in mortality rates between males and females increase with age as mortality rates themselves increase. The greatest absolute difference is observed for ages 85–89, where male mortality rates are 135 per thousand compared to 100 per thousand for women. However, the greatest relative difference occurs in the late teens and early twenties, when males have mortality rates that are almost three times those of females. Gender differences in life expectancies are especially pronounced among Pacific Islanders, Asian Indians, Cubans, and blacks; for each group, women live at least six years longer than men (Figure 5). Gender differences are relatively small (less than four years) among American Indians, Chinese, Japanese, and Vietnamese. On average, U.S.-born women live 4.9 years longer than U.S.-born men, whereas foreign-born women live about 4.1 years longer than foreign-born men.

Numerous explanations have been suggested for why women live longer than men. Higher neonatal and infant mortality rates for males suggest that biology or genetic factors play a role. Higher rates of smoking and greater risks of dying in accidents suggest that behavior also plays a role. In a review of the literature on gender differences in mortality rates, Kalben (2001) states: "Evidence supports both the biological/genetic and the social/cultural/environmental/behavioral schools of hypotheses, as well as interactions between the two, but the determining component may revolve around the differing chromosomes and hormones between the sexes."

Infant Mortality

We examine infant mortality for two reasons: first, because it is an important mortality outcome in its own right, with substantial medical and public health efforts devoted to its reduction; and second, to evaluate the overall patterns of mortality we observed in developing our estimates of life expectancies (see the text box). As with life expectancies, infant mortality rates differ by ethnicity.[8] Generally, we find that ethnic groups with long life expectancies have low infant mortality rates. Exceptions to this pattern could

Figure 5. Additional Years of Life Expectancy of Females Compared to Males, California, 2000



Source: Authors' calculations based on DHS public use files and 2000 census data.
[a]Insufficient data

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Among the major racial and ethnic groups, infant mortality rates are much higher for blacks than for any other racial or ethnic group.

be an indication that our estimates of mortality rates at other ages—and thus life expectancies—are inaccurate, suffering from misidentification of ethnicity or age on death or population records. Exceptions could also indicate differential relative mortality levels by age for certain ethnic groups.

Among the major racial and ethnic groups, infant mortality rates are much higher for blacks than for any other racial or ethnic group (Figure 6). White and Latino rates are similar, with whites having slightly lower rates. Asians have the lowest infant mortality rates. Infant mortality is low for almost all Asian subgroups, and especially so for Japanese, Chinese, and Koreans. However, Hmong and Laotian rates are higher and may be higher than the state average.[9]

Reasons for infant mortality rate differences include maternal health (including risk behaviors during pregnancy), maternal age, and prenatal care. For the infant, premature delivery, low birthweight, and genetic factors may all play a role.

Evaluating the Accuracy of Infant Mortality Rates

Because we develop three measures of infant mortality rates—one combining vital statistics data on deaths in the numerator with population counts from the 2000 census in the denominator, another based solely on vital statistics data on births and deaths, and another using Birth Cohort File figures in the numerator and denominator—we can compare the differences that arise from using differing data sources. We believe that the rates using only the birth cohort data are more accurate for groups with large numbers of births—they use the same data source (which has been constructed to be internally consistent) for deaths and the base population, and thus ethnic identification is consistent. For groups with relatively small numbers of births, we believe the vital statistics data that combine two years of infant birth and death records are the most accurate.

Overall, we find that infant mortality rates developed using census counts of infants are overstated; that is, they are higher than the rates based on the other measures (5.9 deaths per thousand using census counts as the base versus 5.6 deaths based on the Birth Cohort Files and 5.4 deaths per thousand using birth vital records as the base). This difference is due to an undercount of infants in the census, out-migration of infants, or misreporting of their age. Our primary concern, however, is whether the *relative* levels of mortality rates across ethnic groups are consistent from one measure to the next. Table 3 shows three measures of infant mortality rates. For California's largest racial and ethnic groups, infant mortality rates are consistently measured. For example, for

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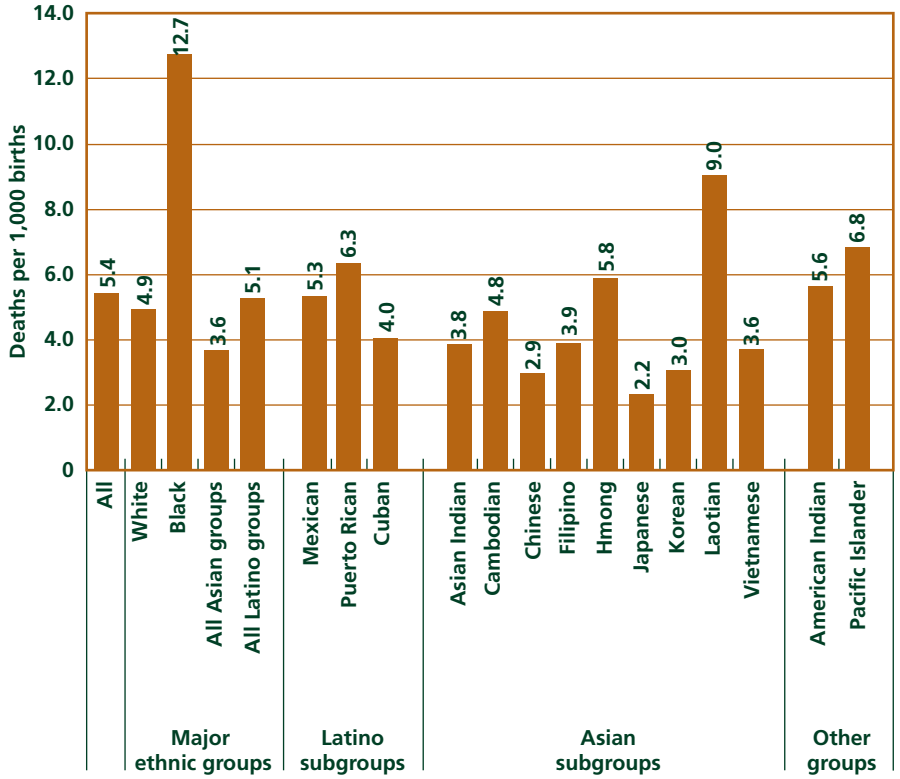
Figure 6. Infant Mortality Rates, California, 2000–2001



Source: Authors' calculations based on DHS vital statistics public use files for births and deaths in 2000 and 2001.

For almost all the groups, relative levels of infant mortality rates are consistent with our findings regarding life expectancies.

blacks, all measures suggest mortality rates over two times higher than the overall state rate. This is consistent with our finding of relatively high mortality rates for blacks of *all* ages in California. Consistency also appears strong for whites and Latinos. All the measures suggest that Asians have the lowest infant mortality, but there is some disagreement regarding the magnitude. The vital statistics measure and the Birth Cohort File measure suggest substantially lower relative mortality rates than does the census-based measure. This suggests that our census base populations might be too low, leading to an overstatement of Asian mortality.

We observe several inconsistencies in relative infant mortality across measures for ethnic subgroups. In some cases, these could be driven by the very small number of infant deaths. Despite these inconsistencies, we note that for almost all the groups, relative levels of infant mortality rates are consistent with our findings regarding life expectancies. For example, Laotians, Cambodians, and Hmong have the highest infant mortality rates among Asians, and they also have the lowest life expectancies of all the Asian groups. In most cases

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Table 3. Estimates of Infant Mortality Rates, California, Deaths per 1,000 Births

	Measure Based on:		
	Birth Cohort File, 2000	Vital Statistics Data, 2000–2001	Vital Statistics with Census Data, 2000
All Californians	5.6	5.4	5.9
Major ethnic groups			
White	4.9	4.9	5.3
Black	13.0	12.7	13.8
All Asian groups	4.0	3.6	5.0
All Latino groups	5.4	5.1	5.8
Latino subgroups			
Mexican	5.5	5.3	6.4
Puerto Rican	4.3	6.3	3.4
Cuban	5.4	4.0	5.5
Asian subgroups			
Asian Indian	3.9	3.8	4.8
Cambodian	4.9	4.8	8.5
Chinese	3.7	2.9	4.0
Filipino	3.6	3.9	4.3
Hmong	5.7	5.8	8.1
Japanese	2.2	2.2	3.5
Korean	2.7	3.0	3.8
Laotian	11.0	9.0	16.0
Vietnamese	5.1	3.6	6.0
Other groups			
American Indian	5.1	5.6	3.8
Pacific Islander	7.2	6.8	11.7

Source: Authors' calculations based on DHS public use files and 2000 census data.

where the measures are not consistent, the infant mortality rates based on vital statistics and census population counts appear to be too high. Because those data sources determine our estimates of age-specific mortality rates at all other ages, if these patterns observed for infants persist for other ages, our estimates of life expectancy will be too low for these Asian subgroups.

Conclusions

The infant mortality rates and life expectancy estimates developed in this report shed new light on mortality in California. As with other estimates, they show substantial differences by gender and between large racial and ethnic groups. To our knowledge, they are the first estimates for some of the state's smaller ethnic groups and the first to incorporate nativity. Here, too, they reveal substantial differences. We see evidence corroborating previous work suggesting that low socioeconomic status and poor access to health care might be driving poor outcomes. However, we also find that for many groups with low socioeconomic status, life expectancies are surprisingly high.

Further research is needed to explore these differences in mortality rates. First, additional research is needed to evaluate the accuracy of California's vital statistics data with respect to racial and

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ethnic identification. Some of our results could be driven by misreporting of ethnic identities or ages on the death records. We have developed estimates using the data at hand and have attempted to evaluate the accuracy of the data for infants—the only group that provides us with the ability to create alternative measures of mortality rates. Future work could involve the matching of death records with other records or developing mortality rates where ethnic reporting might be more accurate (e.g., Merced County for Hmong). Second, the accuracy of census counts for racial and ethnic subgroups needs to be analyzed. This work is best done by the Census Bureau. Indeed, without access to confidential census records, it would not be possible for any other researcher to conduct such work.

Finally, much more research needs to be done to identify factors that determine these different outcomes. Although substantial research has been conducted regarding differences among some of the largest racial and ethnic groups, very little work has been done for many of the smaller ethnic groups identified in this report. ◆

Notes

[1] See the text box, "Measuring Death Rates and Life Expectancies," for details of our approach.

[2] In California, the net undercount rate was 1.5 percent. Net undercount rates were less than 1 percent for whites and Asians; around 3 percent for Latinos, blacks, and American Indians; and almost 5 percent for Pacific Islanders (according to the Census 2000 Block Data Summary File, Adjusted Data, as provided by Julie Hoang of the California Department of Finance).

[3] PPIC's Data Depot provides a table of life expectancies and their 90 percent confidence intervals for all groups.

[4] C. Jane McKendry, Center for Health Statistics, California Department of Health Services, personal communication, 2004.

[5] Our results are less dramatic than those of Hayes-Bautista et al., who had to rely on intercensal estimates of the population for their denominators. They also find that the adolescent male mortality peak among Latinos extends to the 20–24-year-old age group as well; our estimates find very little difference between Latino males and white males in that age group.

[6] Because death rates are slowly but continually declining in the United States, the actual number of years lived for most newborns will be higher than the life expectancies calculated here. Thus, life expectancies are best thought of as estimations of contemporary mortality rates rather than of future rates.

[7] Elo (1996) develops and examines national estimates of mortality for some Asian subgroups.

[8] We do not consider differences in infant mortality among U.S.-born and foreign-born infants, since almost all infants in California are born in the United States.

[9] The infant mortality rate for Laotians is statistically significantly higher than the state average. Hmong infant mortality rates are not statistically significantly different from the state average.

Much more research needs to be done to identify factors that determine these different outcomes.

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